

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Virginia Agricultural Experiment Station

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF *eighteen* YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS OF THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

'BARLEY'

'Pamunkey'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this 28th day of February in the year of our Lord one thousand nine hundred and ninety-five.

Attest:

Kenneth H. Warr
Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Rich R. R.
Secretary of Agriculture

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions on reverse)

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) (as it is to appear on the Certificate) Virginia Agricultural Experiment Station		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NO. VA 89-41-2	3. VARIETY NAME Pamunkey
4. ADDRESS (street and no. or R.F.D. no., city, state, and ZIP) Virginia Polytechnic Institute and State Univ. 104 Hutcheson Hall Blacksburg, VA 24061-0402		5. PHONE (include area code) (703) 231-3766	FOR OFFICIAL USE ONLY VPPO NUMBER <div style="font-size: 2em; text-align: center;">9400258</div> F I L I N G Date August 31, 1994 Time <input type="checkbox"/> A.M. <input type="checkbox"/> P.M. F E E S Filing and Examination Fee: \$ 2,325.00 Date June 20, 1994 R E C E I V E D Certificate Fee: \$ 275.00 Date 2/13/95
6. GENUS AND SPECIES NAME Hordeum vulgare L.	7. FAMILY NAME (Botanical) Gramineae		
8. CROP KIND NAME (Common Name) Winter Feed Barley	9. DATE OF DETERMINATION July 1, 1993		
10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION (Corporation, partnership, association, etc.) Agricultural Experiment Station of Virginia Polytechnic Institute and State University			
11. IF INCORPORATED, GIVE STATE OF INCORPORATION		12. DATE OF INCORPORATION	
13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS Carl A. Griffey Crop and Soil Environmental Sciences Virginia Tech Blacksburg, VA 24061-0404 PHONE (include area code): (703) 231-9789			

14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow INSTRUCTIONS on reverse)

- a. ☒ Exhibit A, Origin and Breeding History of the Variety.
- b. ☒ Exhibit B, Novelty Statement.
- c. ☒ Exhibit C, Objective Description of Variety.
- d. ☒ Exhibit D, Additional Description of Variety.
- e. ☒ Exhibit E, Statement of the Basis of Applicant's Ownership.
- f. ☒ Seed Sample (2,500 viable untreated seeds). Date Seed Sample mailed to Plant Variety Protection Office 1 July 1994
- g. ☒ Filing and Examination Fee (\$2,150) made payable to "Treasurer of the United States."

15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? (See section 83(a) of the Plant Variety Protection Act.)
☒ YES (If "YES," answer items 16 and 17 below) ☐ NO (If "NO," skip to item 18 below)

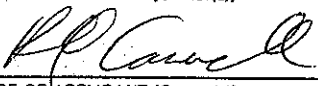
16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
☒ YES ☐ NO

17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED?
☒ FOUNDATION ☒ REGISTERED ☒ CERTIFIED

18. DID THE APPLICANT(S) PREVIOUSLY FILE FOR PROTECTION OF THE VARIETY IN THE U.S.?
☐ YES (If "YES," through ☐ Plant Variety Protection Act ☐ Patent Act. Give date: _____)
☒ NO

19. HAS THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETING IN THE U.S. OR OTHER COUNTRIES?
☒ YES (If "YES," give names of countries and dates) Sold to certified seed growers in the U.S. by Va. Crop Improvement Association in Fall 1993 and will be offered for sale to U.S. producers in 1994. Not sold outside U.S.
☐ NO

20. The applicant(s) declare(s) that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.
 The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in section 41, and is entitled to protection under the provisions of section 42 of the Plant Variety Protection Act.
 Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF APPLICANT [Owner(s)] 	CAPACITY OR TITLE Director, VAES	DATE 6-16-94
SIGNATURE OF APPLICANT [Owner(s)]	CAPACITY OR TITLE	DATE

Pamunkey Barley

14A. Exhibit A: Origin and Breeding History

Genealogy and Breeding Method. Pamunkey barley is a sister line of 'Nomini'. The series of crosses from which Pamunkey was derived was completed in the Spring of 1977. The parentage of Pamunkey is 'Boone'/'Henry'//VA 77-12-41. VA 77-12-41 was derived from a composite of crosses which consisted of CI 9623, CI 9658, CI 9708, and barley yellow dwarf resistant 'Atlas', each crossed to a 'Cebada Capa'/'Wong'//Awnleted 'Hudson' selection. This composite was developed to incorporate resistance to barley yellow dwarf virus into cultivars adapted to Virginia.

Selection and Advancement of the Variety. Pamunkey, formerly designated VA 89-41-2, is a reselection of the experimental line VA 88-11-7. The line VA 88-11-7 was derived from a head selection made in the F_5 generation using a modified bulk breeding system. VA 88-11-7 was heterogeneous, and approximately 50% of the plants had awnleted heads and 50% had heads that were fully-bearded. In 1990, more than 500 heads with full beards were selected from VA 88-11-7 (F_{13} generation) and planted in headrows in the fall of that year. Headrows that were heterogeneous for beard type and other apparent variant rows were removed. The remaining headrows were harvested individually, and seed from 300 of these rows was planted in separate plots at Mount Holly, Virginia in the fall of 1991 to produce Breeder seed. The residual seed from the harvested headrows was composited and used in state and regional variety tests in the 1991-92 season.

Multiplication and Purification. Within the limits of biological expectation, Pamunkey has remained stable and uniform in composition through three generations of selfing. In 1991, three hundred 45 ft² plots of Pamunkey, derived from individual headrows, were planted at the Virginia Foundation Seed Farm. Based on visual observations in the field, disease reactions in greenhouse tests, and evaluation of seed characteristics, plots having variant phenotypes were identified and eliminated. At maturity, 159 of the 300 plots were harvested individually. Seed of these 159 plots was examined for threshability based on the proportion of seed with and without awns intact. Seed from 114 plots selected for ease of threshability was composited to form the initial source of Breeder seed. This Breeder seed was planted on approximately 18 acres at the Virginia Foundation Seed Farm in the fall of 1992. A low percentage of variant types are present in Pamunkey, which consist of not more than 1% plants with awnleted heads. However, Foundation seed of Pamunkey was shown to be genetically stable in the sense that the variety can be maintained and reproduced via seed without changing its characteristics.

Pamunkey Barley

14B. Exhibit B: Novelty Statement

Pamunkey is uniquely different from all known barley cultivars, but is most similar to its sister line 'Nomini'. Both cultivars are similar in maturity and disease resistance. The major difference between these cultivars is that Pamunkey has spikes with long beards, while those of Nomini are awnless to awnleted. Pamunkey is 5 cm shorter than Nomini, and at physiological maturity the straw of Pamunkey is soft, while that of Nomini is stiff and has a "stay-green" characteristic. Pamunkey and Nomini have many similar morphological characteristics; however, Pamunkey has long-haired rachillas, while those of Nomini are short.

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK AND SEED DIVISION
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(Barley)

OBJECTIVE DESCRIPTION OF VARIETY
BARLEY (*HORDEUM VULGARE*)

INSTRUCTIONS: See Reverse.

NAME OF APPLICANT(S)

FOR OFFICIAL USE ONLY

Virginia Agricultural Experiment Station

PVPO NUMBER

9400258

ADDRESS (Street and No. or R.F.D. No., City, State, and ZIP Code)

Virginia Polytechnic Institute and State University
Blacksburg, VA 24061-0402VARIETY NAME OR TEMPORARY
DESIGNATION
Pamunkey

Place the appropriate number that describes the varietal character of this variety in the boxes below.
Place a zero in first box (i.e. or) when number is either 99 or less or 9 or less.

1. GROWTH HABIT:

1 - SPRING 2 - FACULTATIVE WINTER 3 - WINTER Early Growth: 1 - PROSTRATE 2 - SEMIPROSTRATE
3 - ERECT

2. MATURITY (50% Flowering):

1 - EARLY (California Mariout) 2 - MIDSEASON (Betzes) 3 - LATE (Frontier)

No. of days Earlier than } 1 - BETZES 2 - CALIFORNIA MARIOUT 3 - CONQUEST 4 - DICKSON
 No. of days Later than } 5 - PIROLINE 6 - PRIMUS 7 - UNITAN 8 = Barsoy 9 = Boone

3. PLANT HEIGHT (From soil level to top of head):

1 - SEMIDWARF 2 - SHORT (California Mariout) 3 - MEDIUM TALL (Betzes) 4 - TALL (Conquest)

Cm. Shorter than } 1 - BETZES 2 - CALIFORNIA MARIOUT 3 - CONQUEST 4 - DICKSON
 Cm. Taller than } 5 - PIROLINE 6 - PRIMUS 7 - UNITAN 8 = Barsoy 9 = Boone

4. STEM:

Exertion (Flag to spike at maturity): 1 - 0 - 3 cm. 2 - 3 - 10 cm. Anthocyanin: 1 - ABSENT 2 - PRESENT
3 - 10 - 15 cm.

NO. OF NODES (Originating from node above ground)

Collar Shape: 1 - CLOSED 2 - V-SHAPED 3 - OPEN Shape of Neck: 1 - STRAIGHT 2 - SNAKY
4 - MODIFIED CLOSED OR OPEN 3 - OTHER (Specify) straight to gently curved

5. LEAF:

Basal leaf sheath (seedling): 1 - GLABROUS 2 - PUBESCENT Position of flag leaf (at boot stage): 1 - DROOPING
2 - UPRIGHT

Waxiness: 1 - ABSENT (Glossy) 2 - SLIGHTLY WAXY MM. WIDTH (First leaf below flag leaf)
3 - WAXY

CM. LENGTH (First leaf below flag leaf) Anthocyanin in leaf sheath: 1 - ABSENT 2 - PRESENT

6. HEAD:

Type: 1 - TWO-ROWED 2 - SIX-ROWED Density: 1 - LAX 2 - ERECT (Not dense)
3 - ERECT (Dense)

Shape: 1 - TAPERING 2 - STRAP 3 - CLAVATE Waxiness: 1 - ABSENT (Glossy) 2 - SLIGHTLY WAXY
4 - OTHER (Specify) strap and parallel 3 - WAXY

Lateral Kernels Overlap: 1 - NONE 2 - AT TIP Rachis (Hair on edge): 1 - LACKING 2 - FEW 3 - COVERED
3 - 1/4 - 1/2 OF HEAD

7. GLUME:

Length: 1 - 1/3 OF LEMMA 2 - 1/2 OF LEMMA Hairs: 1 - NONE 2 - SHORT 3 - LONG
3 - MORE THAN 1/2 OF LEMMA

Hair covering: 1 - NONE 2 - RESTRICTED TO MIDDLE 3 - CONFINED TO BAND 4 - COMPLETELY COVERED

Awns: 1 - LESS THAN EQUAL TO LENGTH OF GLUMES 2 - EQUAL TO LENGTH OF GLUMES
3 - MORE THAN EQUAL TO LENGTH OF GLUMES

Awn Surface: 1 - SMOOTH 2 - SEMISMOOTH 3 - ROUGH

8. LEMMA:

- ☐ 5 Awn: 1 = AWNLESS 2 = AWNLETS ON CENTRAL ROWS AWNLESS ON LATERAL ROWS
 3 = SHORT ON CENTRAL ROWS, AWNLETS ON LATERAL ROWS 4 = SHORT (less than equal to length of spike)
 5 = LONG (longer than spike) 6 = HOODED
- ☐ 4 Awn Surface: 1 = AWNLESS 2 = SMOOTH 3 = SEMISMOOTH 4 = ROUGH
- ☐ 2 Teeth: 1 = ABSENT 2 = FEW 3 = NUMEROUS ☐ 1 Hair: 1 = ABSENT 2 = PRESENT
- ☐ 1 Shape of base: 1 = DEPRESSION 2 = SLIGHT CREASE ☐ 2 Rachilla Hairs: 1 = SHORT 2 = LONG
 3 = TRANSVERSE CREASE

9. STIGMA:

- ☐ Hairs: 1 = FEW 2 = MANY

10. SEED:

- ☐ 2 Type: 1 = NAKED 2 = COVERED ☐ Hairs on Ventral Furrow: 1 = ABSENT 2 = PRESENT
- ☐ 4 Length: 1 = SHORT (8.0 mm.) 2 = SHORT TO MIDLONG (7.5 - 9.0 mm.) 3 = MIDLONG (8.5 - 9.5 mm.)
 4 = MIDLONG TO LONG (9.0 - 10.5 mm.) 5 = LONG (10.0 mm.)
- ☐ 3 Wrinkling of hull: 1 = NAKED 2 = SLIGHTLY WRINKLED 3 = SEMIWRINKLED 4 = WRINKLED
- ☐ 1 Aleurone Color: 1 = COLORLESS (White or Yellow) 2 = BLUE
- ☐ 0 0 PERCENT ABORTIVE: ☐ 3 2 GMS. PER 1000 SEEDS

11. DISEASE: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

- ☐ 2 SEPTORIA ☐ 2 NET BLOTCH ☐ 2 SPOT BLOTCH ☐ 2 POWDERY MILDEW
- ☐ 0 LOOSE SMUT ☐ 0 BACTERIAL BLIGHT ☐ 0 COVERED SMUT ☐ 0 FALSE LOOSE SMUT
- ☐ 1 STEM RUST ☐ 1* LEAF RUST ☐ 0 SCAB ☐ 2 SCALD
 * Resistant to race 8
- ☐ 0 AY ☐ 0 BSMV ☐ 2 BYDV ☐ 1 OTHER (Specify) stripe rust

12. INSECT: (0 = Not tested, 1 = Susceptible, 2 = Resistant)

- ☐ 0 GREEN BUG ☐ 0 ENGLISH GRAIN APHID ☐ 0 CHINCH BUG ☐ 0 ARMYWORM
- ☐ 0 GRASS HOPPERS ☐ 0 CEREAL LEAF BEETLE ☐ 0 OTHER (Specify) _____
- HESSIAN FLY RACES ☐ 0 GP ☐ 0 A ☐ 0 B ☐ 0 C
☐ 0 D ☐ 0 E ☐ 0 F ☐ 0 G

13. CHEMICAL (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

- ☐ 0 DDT ☐ 2 OTHER (Specify) Heelon

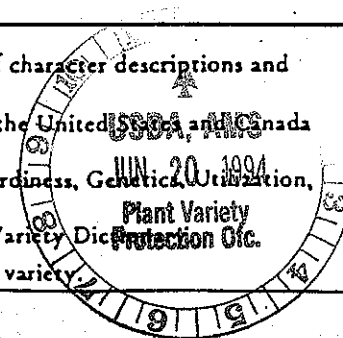
14. INDICATE WHICH VARIETY MOST CLOSELY RESEMBLES THAT SUBMITTED:

CHARACTER	NAME OF VARIETY	CHARACTER	NAME OF VARIETY
Plant tillering	Nomini	Seed size	Nomini
Leaf size	Nomini	Coleoptile elongation	Nomini
Leaf color	Nomini	Seedling pigmentation	Nomini
Leaf carriage	Nomini		

REFERENCES: The following publications may be used as a reference aid for the standardization of character descriptions and terms used in this form:

- Wiebe, G. A., and D. A. Reid, 1961, Classification of Barley Varieties Grown in the United States and Canada in 1958, Technical Bulletin No. 1224, U.S. Dept. of Agriculture.
- Reid, D. A., and G. A. Wiebe, 1968, Barley: Origin, Botany, Culture, Winter Hardiness, Genetics, Utilization, Pests, Agriculture Handbook No. 338, U.S. Dept. of Agriculture. pp. 61 - 84.
- Malting Barley Improvement Association, Milwaukee, Wisconsin, 1971, Barley Variety Description.

COLOR: Nickerson's or any recognized color fan may be used to determine color of the described variety.



Pamunkey Barley

14D. Exhibit D: Additional Description of Pamunkey

Pamunkey is an early maturing, moderately short, six-row winter feed barley (*Hordeum vulgare* L.) with compact strap and parallel spikes. Lemma awns of Pamunkey are rough, longer than the spike and have a purple color shortly after flowering. Early growth is semi-prostrate, penultimate leaves average 19 cm in length and 13 mm in width, and the distance from the flag leaf to the spike is more than 10 cm. Pamunkey has gently curved necks and spikes that are slightly waxy and erect with a few overlapping lateral kernels at the tip. The rachis is tough with hairy edges, and the collar is closed. The glumes of Pamunkey are one-half the lemma in length and have hairs confined to the band. Pamunkey has semi-smooth to rough glume awns that are longer than the glumes in length. The yellow lemmas have few teeth on lateral and marginal nerves, with a depression at the base. Pamunkey has midlong to long covered, white, semiwrinkled seed with long-haired rachillas.

Since Pamunkey has not been tested in comparison with any of the seven cultivars listed in Exhibit C, data on performance in Virginia in 1992 and 1993 are presented in Tables 1a and 1b, which follows this section. Pamunkey also was evaluated in the 1991-92 Uniform Winter Barley Yield Nursery. Performance data for these nurseries are available in USDA nursery reports compiled by Dr. David Livingston at Pennsylvania State University.

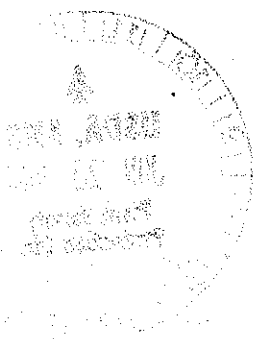


Table 1a. Comparative Performance of Pamunkey Barley in Virginia in 1992.

Variety	Yield (Bu/Ac) [5]	Bushel Weight (lbs.) [5]	Date Headed (Mar31+) [4]	Height (inches) [3]	Lodg. % [4]	Powdery Mildew % [2]	Leaf Rust (0-10) [3]	Disease Reaction	
								Powdery Mildew	Leaf Rust
Starling	127+	48.4	20+	39+	22	0	4-	R	MR
Pamunkey	124+	53.2+	18	37	26	0	8	R	MS
Nomini	125+	49.1	18	39+	23	0	6-	R	MS
Barsoy	91-	49.7	16-	35-	6-	21+	10+	S	S
Sussex	104-	46.7-	15-	40+	37+	0	10+	R	S
Boone	107-	48.6	22+	39+	41+	36+	10+	S	S
Wysor	118	49.0	20+	39+	23	0	10+	R	S
Pennco	121+	48.5	20+	40+	21	0	3-	R	MR
Mollybloom	114	48.8	20+	39+	31	3	10+	R	S
Mulligan	111	49.2	22+	38	39+	26+	10+	S	S
Location Avg.	114	49.2	18	36	22	04	08		
L.S.D. (0.05)	06	01.2	02	02	13	09	02		
C.V.									

* The number in parentheses below column headings indicates the number of tests on which data are based. A plus or minus sign indicates a performance significantly above or below the test average, respectively.

** R = Resistant, MR = Moderately Resistant, MS = Moderately Susceptible, S = Susceptible.

*** These number are ratings on a 0-10 scale with 0 = none and 10 = near total leaf coverage.

Table 1b. Comparative Performance of Pamunkey Barley in Virginia in 1993.

Variety	Yield (Bu/Ac) [5]*	Bushel Weight (lbs.) [5]	Date Headed (Mar31+) [3]	Height (inches) [3]	Lodg. % [5]	Leaf Rust % [2]
Starling	115	46.6-	26	43	55+	19-
Pamunkey	115	52.5+	24	40	29	37
Nomini	121	47.2-	23-	43	26	27
Barsoy	84-	51.2+	22-	39-	20	74+
Venus	102	51.3+	23-	40	42	65+
Boone	95-	47.8-	30+	44	74+	40
Wysor	105	48.1-	25	43	37	44+
Pennco	108	47.3-	27+	44	39	28
Mollybloom	101	48.3	30+	44	66+	56+
Mulligan	97-	48.1-	27+	43	53+	46+
Location Avg.	111	49.5	25	42	34	32
L.S.D. (0.05)	11	1.3	1	2	15	10
C.V.						

* The number in parentheses below column headings indicates the number of tests on which data are based. A plus or minus sign indicates a performance significantly above or below the test average, respectively.

Pamunkey Barley**14E. Exhibit E. Basis of Applicant's Ownership**

The owner of Pamunkey barley is the Virginia Polytechnic Institute and State University, of which the Virginia Agricultural Experiment Station is a part. Employees charged with developing this new cultivar as a condition of their employment understand that ownership rests with Virginia Polytechnic Institute and State University pursuant to university policy on intellectual property.

